

## WHAT IS CLAIMED IS:

1. A method for optimizing an efficiency of a data processing system, the method comprising the steps of:

14.5.D identifying a plurality of operations awaiting execution at at least one service component of said data processing system;

5 at run time, assigning an initial priority ranking to each of said plurality of operations prior to run time; and

modifying said assigned initial priority rankings at run time to optimize said efficiency of said data processing system.

2. The method of claim 1 further comprising the steps of:

determining a service demand placed upon each of said at least one service component in said data processing system arising from performance of said plurality of operations;

estimating a utilization rate for each of said at least one service component based on said determined service demands, wherein said step of modifying comprises the step of adjusting said assigned initial priority rankings at run time to substantially equalize said utilization rates of said at least one service component.

3. The method of claim 1 wherein said plurality of operations comprise operations internal to said at least one service component and operations external to said at least one service component, the method further comprising the step of:

5 selecting one of an internal operation and an external operation for execution from said plurality of operations based on a utilization rate of said at least one service component.

4. The method of claim 3 wherein said selecting step comprises:

directing said at least one service component to execute said operations external to said at least one service component when said utilization rate is below a pre-determined threshold.

5. The method of claim 4 wherein said directing step comprises:

adjusting priority rankings of said external operations so as to surpass priority rankings of said internal operations.

6. The method of claim 1 wherein one of said plurality of service components is a hierarchical storage device and said plurality of operations comprise operations internal to said storage device and operations occurring between said storage device and a host device and wherein said selecting step comprises the step of:

at run time, selecting one of an operation internal to said storage device and an operation occurring between said storage device and said host device based on a utilization rate of said storage device.

7. The method of claim 1 wherein one of said plurality of service components is a hierarchical storage device and said plurality of operations comprise direct data transfer operations between a device external to said hierarchical storage device and combinations of said direct data transfer operations and migrations of data between different levels of said hierarchical storage device and wherein selecting step comprises the step of:

at run time, selecting, for execution, one of a direct data transfer operation and said combination of a direct data transfer operation and a migration of data between different levels of said hierarchical storage device, based on a utilization rate of said hierarchical storage system.

8. The method of claim 7 wherein said selecting step comprises the step of:

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causing said hierarchical storage device to execute substantially only said direct data transfer operations when a utilization rate of said hierarchical storage device is below a predetermined threshold.

9. A system for providing adaptive performance optimization of a data processing system, the system comprising:

at least one hierarchical storage device having a plurality of storage levels;

a host device for conducting communication with said at least one hierarchical storage device; and

a priority manager for prioritizing work requests affecting data stored in said at least one hierarchical storage device during run time of said data processing system.

10. The system of claim 9 further comprising:

a request queue in communication with said priority manager for storing work requests incoming from said host device and from said at least one hierarchical storage device.

11. The system of claim 10 wherein said stored work requests comprise:

external work requests describing a data transfer operation between said at least one hierarchical storage device and said host device; and

internal work requests describing a data transfer operation between different levels in said at least one hierarchical storage device.

10003127-1

a utilization evaluator for calculating utilization rates of said at least one hierarchical storage device based upon said stored work requests in said request queue.

a workload identifier for identifying each of a plurality of workloads;

a performance demand associated with each of said plurality of workloads, thereby establishing a plurality of performance demands; and

14. The system of claim 13 further comprising:

a ranking controller for adjusting at least one of said initial priority ranking in order to service a performance demand of at least one of said plurality of workloads.

a service level guarantee associated with one of said performance demand for establishing a minimum level of service for said one of said performance demand.

16. A computer program product having a computer readable medium having program logic recorded thereon for optimizing an operation of a hierarchical RAID (redundant array of independent disks) storage device included in a data processing system, the computer program product comprising:

5           code for transferring data blocks between said RAID storage device and a host device  
of said data processing system;

code for migrating selected data blocks between different levels of said RAID storage device; and

code for determining, during run time of said data processing system, an order for executing said code for transferring and said code for migrating.

17. The computer program product of claim 16 further comprising:

code for establishing an initial priority for work requests including said code for transferring and work requests including said code for migrating, wherein said work requests including said code for transferring are transfer work requests and said work requests including said code for migrating are migrating work requests.

18. The computer program product of claim 17 further comprising:

code for determining a service demand imposed upon said RAID storage device based on said transfer work requests and said migrating work requests.

19. The computer program product of claim 18 further comprising:

code for modifying said established initial priority for said transfer work requests and said migrating work requests based upon said determined service demand.

20. The computer program product of claim 19 wherein said code for modifying comprises:

code for adjusting said established initial priority to substantially equalize utilization rates at at least two of said different RAID storage levels.

10003127-1